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TECHNICAL DEVELOPMENT OF SOVIET AGRICULTURE
DURING THE TRANSITIONAL PERIOD FROM SOCIALISM TO COMMUNISM

8. Matskevich

SUMMARY

Soviet agriculture is now developing at an unprecedented rate. Agrobiology is revolutionizing methods of cultivation. The present period, the transition from Socialism to Communism, can be subdivided into two stages: (1) complete mechanization of agricultural operations with the internal-combustion tractor as the principal power generator; gradual electrification wherever possible; and (2) electrification of field work, with the electric tractor replacing the internal-combustion tractor.

Complete electrification, a project unattainable in any capitalist state, will completely transform the work in agriculture as well as the life and the cultural level of the farmer. Completion of the whole project will correspond to the establishment of Communism in the USSR.

Soviet agriculture is now facing the problem of creating abundant stocks of goods and raw materials, and of accumulating reserves and "security stocks" for many years ahead. The USSR is now in the period of transition from Socialism to Communism; the abundance of products is designed to replace distribution according to work performed by a distribution according to the needs of each individual.

In agriculture this abundance can be achieved by making all cultivated land produce crops which now are obtained only on advanced kolkhozes. Yields on advanced kolkhozes average approximately 20 centners per hectare for cereals, 300 centners per hectare for beets, etc. The problem, therefore, involves a considerable increase in productivity for the whole Soviet Union. Despite its

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difficulty the task does not seem insurmountable since many kolkhozes have already reached these figures. The total area of advanced farms already surpasses that of any western European state: in 1937, 9,259 kolkhozes produced over 16 centners per hectare for a total area of 8 million hectares, which is equivalent to that which was under cereals in prewar Germany [1]. Moreover, in 1947 and 1948 kolkhozes surpassed the prewar averages of production.

Artels, machine-tractor stations (MTS) and collective farms have made a tremendous contribution to the building of socialism. These organizations ensured the development of the agricultural potential, improved the workers' welfare and raised crop yields 200 - 300 percent. In the building of communism, agriculture will rely on a new and improved technical foundation consisting of modern agricultural methods applied in every kolkhoz, of highly developed equipment and of electrification. These foundations are now in the process of being established.

Modernization of agricultural methods implies rational development of agricultural potentials. In the future, every kolkhoz must apply the methods of field rotation and grass cultivation. Cultivation of perennial grass is to be particularly developed; in 1950, the acreage sown will be double that of previous years. Considerable expansion will take place in cultivation of high-quality wheat, leguminous plants, corn, lupine, groats, sugar beets and cotton. Along with the application of field rotation, new lands will be put into cultivation, their acreage amounting to that of entire countries.

Scientific cultivation must be supplemented by scientific soil fertilizing. Different kinds of fertilizers (mineral, turf, green, locally collected organic fertilizers) will be used on a large scale. New discoveries in agrobiology made by Michurin will be applied. The scientific regeneration of fertility is opposed to the system of extensive cultivation applied by specialized US enterprises. The theory of Michurin-Williams-Lysenko will provide Soviet agriculture with new plant and animal cultures, and with new raising methods.

The projected agricultural technology also requires extensive reclamation work. Field protective belts and clumps will be planted to prevent the soil from eroding and pastures and crop fields from drying up.

The experiment of the Dokuchayev station and of the grass-field farms of the Southeast, including the Millerovo MTS show that the first attempts have already provided for a steady increase in crop yields amounting to 5.4 centners per hectare, an 80 percent increase in profits from animal husbandry, etc.

Large irrigation projects will be developed in the republics of Central Asia, in the Central Russian highlands, in the areas along the left bank of the Volga, in the Southern Ukrainian steppes and in other dry lands. The ground-work is being laid for construction of hydrotechnical installations on the Volga, the Dnepr and a number of smaller rivers.

Kolkhozes will also follow this general trend. Vegetable and fruit gardens occupy an increasingly important place. Establishment of large gardens and apiculture is contemplated. Animal husbandry will expand, involving the development of mechanized equipment for processing its products; fodder cultivation is also to be enlarged. Many agricultural products will be processed by the producing enterprise and kolkhozes will become multibranch enterprises. This increase in functions is characteristic of progressive industrialized agriculture.

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Modernization of agriculture implies adequate working facilities. During World War II necessary measures were taken to ensure postwar agricultural development. Production of chemical fertilizers has increased several hundred percent. Large agricultural regions have already been electrified.

The use of electricity is not limited to domestic needs as in the US. It is being widely introduced in agriculture for the needs of production itself. The technical equipment now being built in the USSR could not be duplicated in any capitalist country. While the agriculture of the US is still relying upon low-power wheel tractors, the Soviet tractor industry is being converted to produce powerful caterpillar tractors. Heavy industry has been enlarged and renovated. Eight tractor plants and six combine plants, instead of the three of each kind which now exist, will soon operate. The production technique will make it possible to supply every branch of agriculture with improved mechanized equipment. The Soviet agricultural equipment program, in keeping with Marxist theory, produces "agricultural machines which, although different in kind, supplement each other." [2] Grain cultivation already has at its disposal a system of mechanization for every phase of the work.

The following branches are not mechanized yet: industrial-crop cultivation; fodder, potato and vegetable culture; gardening, animal husbandry, many farmstead jobs and processing operations, and irrigation. However, Soviet designers have already shown good results in devising new equipment; plough tractors, electric tractors, self-propelled combines, potato diggers, and beet diggers. During the seasonal periods of intensive work, seven or eight processes now tie up manpower, horses, tractors, and other means of production. These processes will soon be mechanized. A wide utilization of engineless and self-propelled combines with straw and chaff pressing devices, beet combines, flax combines, potato combines and other machines, will open the way for establishing a really universal system of machinery. For field work, agricultural machines which can be coupled to the tractor automatically will be built.

The socialist system of mechanizing during the transition from Socialism to Communism can be outlined as follows: (1) establishment of a planned, complete, uninterrupted and complex mechanization of operations in agriculture; (2) combination of internal combustion and electric power, with a view to subsequent unity on the basis of electrification; and (3) development of automatic machine combines, self-propelled equipment, and a system of tractors and stationary engines of uniform power.

When agriculture reaches its full development, it will rely completely upon electricity. Branches of intensive cultivation and such powerful factors of productivity as irrigation and fertilization will benefit from this efficient stimulant to their development. Complete electrification, corresponding to the establishment of Communism, will mark a new technical revolution in the country.

The transition to Communist techniques in agriculture is to be done progressively. During the period of transition, projects are to be carried out in two stages.

In the present stage, the internal combustion engine remains the basis of mechanization, and tractor-powered equipment will be continuously developed. Meanwhile, production processes in agriculture and especially in animal husbandry, will be gradually electrified.

In the second stage, electric tractors will be used in fields, and internal combustion will be gradually eliminated by electric power.

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Since the development of agriculture is now in its first stage, measures have been taken to provide mass production of Diesel and gas-generator tractors (Plenary Session, TsK VEP (b), February 1948). By the end of the current Five-Year Plan, tractor production will more than double in comparison with the prewar period. In 1950, tractor plants will provide 133,000 new and more powerful tractors, averaging 36 horsepower at the drawbar. Annual production will reach 6 million horsepower, corresponding to 4.8 million horsepower at the drawbar. A progressive power scale will replace that which exists now (in horsepower at the drawbar):

Present power scale	--	10	15	32	48	50
Progressive power scale	6	12	24	36	48	60

The postwar Five-Year Plan provides for construction of 325,000 new-type tractors with a total power of 10.8 million horsepower at the drawbar. The tractor pool, which before World War II surpassed 630,000 units, will be thus renewed, ensuring the achievement of mechanization. Tractor-operated equipment will also be improved and enlarged. Special attention will be given to combines, 173,000 of which will have been supplied by 1950 (Appendix 1).

Higher technical standards for tractors are by no means limiting the introduction of electricity in Soviet agriculture. It has been ascertained that at present, maximum efficiency is achieved by combining the use of both.

Agriculture, however, still depends on internal combustion engines and combines (Appendix II). The power range of gas tractors is now sufficiently developed (from 4 to 80 horsepower). These tractors are economical (250 grams of fuel per horsepower per hour) and very maneuverable. In large enterprises they can operate from 8 to 10 months a year in the field, and the rest of the year can be used for transportation.

For the time being, the electric motor is an adequate power generator for stationary operations only. Under such conditions, other types of motors cannot match it. The electric tractor still does not answer the technical requirements and would depend on a rather extended network of power supply. Moreover, the existing models of field equipment are adapted only to gas tractors.

At this point, it should be emphasized that the part of electrification has been very often overestimated in Soviet publications. Professor Vlasov ⁴³ has attributed the results achieved in the "Zarya" Kolkhoz to electrification. The conclusion of Professor Vlasov is wrong: merit goes to the patriotic effort of kolkhoz workers, to the agricultural technique in general and to the latest achievements in agrobiolgy.

It should be remembered that along with the development of mechanization comes a modification of the whole structure of power expenditure. While technique is progressing and agricultural branches are being developed, the main burden of work is shifting from field work to other operations (Appendix III). The volume of electric consumption and the type of consumer depends entirely on the general development of the agricultural art. In the Sverdlovsk Oblast, where 2,149 kolkhozes are electrified, there is an average of only two electric motors per kolkhoz. The main part of the current is consumed for lighting. An advanced kolkhoz such as "Zarya," in the same oblast, has 46 electric motors. In 1946, the average expenditure of electric current there was almost 500 kilowatt hours per worker and about 1,000 kilowatt hours per farmstead (Appendix IV). However, in this enterprise, the consumption of tractor power is still 600 - 700 percent larger than that of electricity, with each kolkhoz worker disposing of approximately 3,000 kilowatt hours of tractor power. The level of electrification, even in advanced kolkhozes, is still low and the current provided ranges from 6 to 20 percent of the potential consumption in the immediate future. In many cases electrification is hampered by lack of motors or equipment and also by consumer backwardness.

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[NOTE: Sverdlovsk Oblast is often mentioned in Soviet agricultural publications as one of the most advanced in electrification. "Iskra" and "Zarya" kolkhozes seem to be among those setting the pace in this region [4].]

In the present stage, electricity will be used extensively for artificial irrigation (one million hectares according to the 1948 plan) and for such mechanized processes in animal husbandry as milking and shearing. As is known, Soviet milking machines are far superior to those of US make.

Although in kolkhoz transportation the work is done primarily by trucks, carts, and overhead trolleys, the use of electric conveyers, hoists, loaders and elevators will be considerably developed. Such a project implies the establishment of rated power ranging from 25 to 100 kilowatts. The power requirements would vary from 85,000 to 350,000 kilowatt hours per kolkhoz per year, depending on the size and the development of the enterprises. [5]

Electrification will be further extended to field work, transportation and heating processes, such as grain and hay drying, water heating, heating of buildings, fodder storage in animal husbandry; incubators, brooders, etc. Heat and refrigeration will be especially needed in initial processing of farm products, such as sterilization of milk, butter production, meat, vegetable and fruit preserving, starch syrup, cheese and other production.

Electrification of advanced kolkhozes in the USSR already surpasses that of capitalist farms. The US has 500,000 electric motors in agriculture, whereas the USSR will have 800,000 by the end of 1950. There are already many oblasts, where every kolkhoz uses electricity in stationary operations. These kolkhozes are now electrifying processes in animal husbandry and in subsidiary branches. However, electrification of the main types of field work has not begun yet. Internal combustion tractors will, therefore, remain a long time as the principal power in agriculture. Nevertheless, the role of electrification is still great, since under Communism it will become the basic source of power in agriculture.

Socialism was built by the machine-tractor stations.

In the building of communism, electrification will grow in importance. Tens of thousands of electric stations totaling 10 - 12 million kilowatts, and several million motors will have to be built. The annual consumption will rise to 30 million kilowatt hours.

An economy of labor 150 percent greater than that provided by tractors will result. Every kilowatt hour used in agriculture will correspond to a saving of approximately one man-hour of labor.

Electrification will play an outstanding part in the following: (1) establishment of a multibranch agriculture and further development of animal husbandry, vegetable gardening and processing enterprises; (2) large reclamation and irrigation projects, and (3) establishment of a system of organic and mineral fertilization.

Machine-tractor stations have already begun research on new machinery, designed primarily for field work. The existing equipment is very often obsolete.

Complex machinery (grain and beet combines, threshers, etc.) will be equipped with small motors and elevators, thus providing for new mechanized operations, such as hay stacking, handling etc.

Tractors will have small hydraulic hoists for lifting the coupling piece of any given machine onto the drawbar of the tractor, thus making coupling entirely automatic. Agricultural machinery will be completely transformed. Plows and harrows, for instance, will be replaced by revolving devices of the cutter type. Mechanical transmission will be eliminated.

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The advantage offered by electric motors and automatic coupling will be the elimination of the present complicated set-up in operating, maintenance, repair, and water and fuel supply. An army of mechanics, complers and other workers will be released.

Great emphasis will be placed on the development of new agricultural machines requiring less metal in fabrication and using less fuel or power. These machines will be lighter and easier to operate.

The existing types of equipment, although reducing labor expenditure over the whole period of a year, still do not replace sufficient manpower during the period of intensive work in agriculture. In eastern regions, non-ch. frozen regions and southwestern Ukraine labor expenditure increases with agrotechnical development. Therefore, it is indispensable that operations involving intensive work, such as subsidiary work in grain harvesting and threshing; hay harvesting, sown grass, potatoes, beets, cotton, flax; initial flax processing, etc, be mechanized. For example, in combine grain harvesting the labor expenditure amounts to 3.57 man-days per hectare, in which 3.27 man-days represent the labor spent on subsidiary, nonmechanized operations. Mechanization of this branch and improvements in the others, according to estimates, will result in a considerable saving (Appendix V).

The electric tractor itself will not be ready for general use in the near future, but this does not minimize its importance during the transitional period. Experiments, which started in 1920 under sponsorship of Lenin, have been carried on systematically. In 1930, Midebulidze and Amiradzhibi built the first Soviet electric tractor. The work was continued by engineers Listov and Stetsenko, members of the All-Union Institute of Mechanization and Electrification of Agriculture. At present, the Soviet electric tractor is the best in the world and has a number of advantages over the internal-combustion tractor. Data provided by the Engels Machine-Tractor Station show an economy for repairs of 5 rubles per hectare of plowland. In 6 years, internal-combustion tractors underwent five capital repairs, while electric tractors only required chassis reconditioning. When in use, it will provide for an economy of millions of tons of oil and hundreds of thousands of ton-k cars. A great number of workers and horses now supplying water and fuel will thus be made available. With a kilowatt-hour estimated at 0.10 rubles and a kilogram of kerosene at 0.50 rubles, the cost of plowing will be reduced by 5 rubles per hectare. The cost of amortization of electric tractors is lower because of their much longer service. The reduction in service personnel also means a reduction in personnel expenses. The total reduction of cost per hectare of plowland can surpass 10 rubles.

The main problem faced by designers is to devise a power supply system which will make it possible to discontinue the costly operation of two tractors in the same field.

According to estimates, electrification of field work can provide an economy of labor equivalent to the release of two million men. In all agriculture, manpower requirements will be reduced by 12 million men. Considering the increasing volume of production, labor expenditure will be cut down by 20 - 30 percent. These calculations were made for the principal agricultural zones, groups of kolkhozes, branches of agriculture and periods of activity in agriculture. They are based upon experiments in advanced kolkhozes of various sizes and take into account levels of production provided by the plan for subsequent development. Moreover, electrification of stationary work in kolkhozes will economize 825 million horse-days, which is equivalent to a release of 3,300,000 horses.

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Every local source of power should be used for the production of electric current. Long distance and costly transportation of fuel can thus be discontinued.

Prospecting, which was carried out along with development of a general scheme of electrification in agriculture, led to the discovery of various and large resources in practically every region. Small rivers, including those of the southern regions, can provide 40 percent of the power required. New oil and gas fields have been discovered in the Azov, Kuban', Volga, Bashkir and other regions, as well as in the southern and southwestern regions where the fuel shortage is particularly acute. The Right Bank and Western Ukraine, the Transcaucasus region, Central Asia, Kazakhstan, the Baltic regions, the Urals and Belorussia are adequately provided with hydraulic resources, peat, brown coal and oil shales. In these regions numerous mines and briquet plants are operating, and a great number of peat and brown coal exploitations are planned to provide fuel for agricultural electrification and for a part of the tractor park.

Governmental decisions (February 1945 and May 1948) provide that electrification projects must be carried out by the kolkhoz workers themselves, and that electric stations will remain kolkhoz property. Interkolkhoz electric stations will represent a new and more developed form of kolkhoz property, preparatory to "all-people" ownership.

Just as machine-tractor stations do not represent tractor renting enterprises, electric stations in agriculture are not to be confined to the business of producing and selling electric current. They must contribute to the general increase of productivity by preparing the consumer, and organizing and increasing the consumption. They also must contribute to development of backward kolkhozes and lagging branches of production. This task is to be placed under supervision of the Soviet of Electric Stations. Electric stations and machine-tractor stations will operate as independent systems, coordinating within the Soviet of Machine-Tractor Stations the organizational problems of the various kolkhoz branches. Machine-tractor stations, as State organizations, will retain the organizational leadership.

An extended use of electric power will result in increased and stabilized crop yields, in larger and more productive cattle herds, in more industrial and subsidiary enterprises and in larger profits. This will contribute to a speedily expanded reproduction of the social product in kolkhozes. Along with the rise in productivity the cost of agricultural production will decrease. Electrification will transform work in agriculture into a variety of industrial operations.

Electrification will make it possible to replace ordinary labor with skilled labor and will stimulate cultural development. Technical improvements in the country are intimately bound up with the growth of the material and cultural welfare of workers. Separate, comfortable apartments for every kolkhoz family, with electricity, water, telephone, radio and an economical heating system (briquets) is a real possibility. Transition from Socialism to Communism will bring about radical changes in the techniques and the character of work in agriculture, in its production and in the material and cultural life of the farmer, thus erasing the discrepancies which exist between city and village life.

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Appendix I. PLANNED TRACTORS OF THE PROGRESSIVE POWER SCALE

<u>Horsepower (at the drawbar)</u>	<u>Engine</u>	<u>Tires</u>	<u>Utilization</u>	<u>Remarks</u>
6	Gas	Pneumatic tires	Gardens and vegetable gardens	Blueprints completed by All-Union Institute of Agricultural Machine Building
12	Gas	Pneumatic tires	Most universal type; to be used in small kolkhozes. In larger enterprises, to be used for light work and plowing.	Modernization of existing "U-1-2." Will have multiple gear shift.
24	Diesel	Caterpillar	Wide-scale use in cotton and beet-culture regions	Basic prewar type "Kirovets T-35" now the most advanced Soviet tractor. Will have improved caterpillar tread, five-speed gearshift, consumption - 220 grams of low grade oil per HP/hour.
36 - 48	Diesel	Caterpillar	Principal type for large and medium kolkhozes	Modernized design of the existing "STZ-NATI" and "Stalinets - 65." In 1948, tread mechanisms of the "STZ-NATI" will be improved.
60			Special type for very large enterprises (sovkhozes) and heavy work (reclamation)	"Stalinets - 80," already in operation.
--	Gas generators		In regions locally supplied with coal briquets, peat or waste from forest industries and agriculture.	"KMTZ - T20" must be modernized. Special type of gas-generator tractor must be developed.

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Appendix II. MECHANIZATION AND SOURCES OF POWER ON THE "ISKRA" KOLKHOZ,
SVERDLOVSK OBLASTA. Sources of Power: primarily local resources -- wood, fuel, electricity per
kolkhoz workerB. Average Power Supplied (in HP)
per 100 hectares of plowland 54.4C. Equipment and Personnel Employed

	<u>In Branches Using Internal-Combustion Power</u>	<u>In Branches Using Electric Power</u>
No of personnel employed	220	80
No of tractors		
Gas generators	6	
Diesel	1	
Kerosene	1	
Total tractors	8	--
Automobiles (gas generator)	2	--
Electric motors	--	48

D. Other Equipment

Locomobiles (wood-burning)	2
Boiler with steam-supply system	1
Fodder steamers	2
Drying chamber for grain and wood	1
Charcoal burner for forge	1

E. Draught Animals

Oxen	67
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<u>Sources of Power</u>	<u>Percent of Total Power Available</u>	<u>Percent of Total Work Accomplished</u>
Tractors	41	42
Combines	10	2.5
Automobiles	13	14
Stationary internal-combustion engines	5	5
Electric station	17	17
Total, mechanical	86	80.5
Horses and oxen	14	19.5
	100	100.0

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Appendix III. ENERGY EXPENDITURE ON THE "ZARYA" KOLKHOZ [6]

<u>Branch of Operations</u>	<u>Consumption of Total Power Available (percent)</u>
Field cultivation	41
Fruit and vegetable gardens	9
Animal husbandry	19.6
Subsidiary and industrial enterprises	21.7
Cultural and social organizations	8.7

Appendix IV. DISTRIBUTION OF ELECTRICITY IN ADVANCED KOLKHOZS

<u>Consumer</u>	<u>Average in Advanced Kolkhozes (percent)</u>	<u>"Zarya" Kolkhoz (percent)</u>
Subsidiary and industrial enterprises	50	45
Agriculture	25	18
Lighting	21	17
Animal husbandry	4	20

Appendix V. ECONOMY OF LABOR

<u>Improvements in Various Branches</u>	<u>Resulting Economy</u>
Mechanization of subsidiary operations in harvesting	800 to 900 million man-days
Electrification in animal husbandry	1 billion man-days
Electrification of stationary work including irrigation	500 million man-days
Electrification of industrial enterprises and to some extent work involving cultural and domestic needs	1 billion man-days

According to estimates, mechanization of subsidiary operations in harvesting would result in a release of 7.5 million kolkhoz workers from field work during that period.

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